THE
VETERINARY JOURNAL

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Obituary

THE LATE MR. ARTHUR HOLMAN BERRY, F.R.C.V.S.

MANY members of the profession have been brought into contact at one time or another with Arthur Berry, whose duties as a Senior Veterinary Inspector of the Ministry of Agriculture and Fisheries made him a prominent figure in extensive outbreaks of Foot and Mouth and other animal diseases ; and his tactful and quiet manner of dealing with things, especially when they looked most awkward, gained for him the confidence, not only of his colleagues but that of the lay public amongst whom he had to administer the law.

As a student at the London College, from which he graduated in 1896, this same quiet and genial personality gained him many friends, and he would take an infinity of pains to help a backward fellow student.

After a brief period in practice he joined the Ministry of Agriculture on probation, being soon taken on the Permanent Staff, and eventually working his way up to the Chief Inspectorship of the South of England, a position which he was occupying at the time of his unexpected demise.

Always taking interest and pride in professional affairs he took the Fellowship Diploma in 1901, and on various occasions he brought forward papers of interest or took prominent part in discussions before one or other of the branches of the National Veterinary Medical Association.

His unexpected and sudden death has left a gap amongst his personal friends which it will be hard to fill, and the profession has lost a conscientious worker. The sympathies of those who had the privilege of his acquaintance and friendship will be extended to his widow and immediate relatives.

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THE VETERINARY "DOCTORATE."

In last month's number it will be recollected that we published a number of regulations under which the graduate with the M.R.C.V.S. diploma could follow up post-graduate studies in Germany and Switzerland, and take the University degree of Doctor of Veterinary Medicine. In this month's issue we add to this list the regulations which govern the ambition of those who would prefer to take it in France, and also the regulations of the Munich School.

We again urge our young graduates to consider the matter and to assure them that the idea is well worth following up; not only from the point of view of increased and widened scope of knowledge, but from the point of view of learning another language and being equipped on an equality for competition for Colonial Veterinary posts, especially those in South Africa.

As stated in the last issue of the Journal several members of the British Veterinary Profession have already taken the Veterinary doctorate degree, and the proportion of our colleagues in the South African Government Department who have taken advantage of their study leave to spend it in Europe and take the Continental Doctorate Diploma, illustrates forcibly that there are advantages to those who possess it as an added distinction to their respective names.

SPECIAL NUMBERS OF THE "VETERINARY JOURNAL."

On numerous occasions in the past the Veterinary Journal has issued Special Numbers devoted wholly or in part to special subjects or headings. Requests that these shall be repeated have for some time reached the Editorial Office from various parts of the Empire, and now that Sir Frederick Smith's great work has been completed, the Veterinary Journal will return to its normal methods, which will include the special issues on special subjects as above mentioned.

In pursuance of this object the December number will be a special Poultry Number, and will be devoted to the latest laboratory and clinical research work which has been done on Poultry and other birds. The diseases of the domestic fowl, and other birds, has been so neglected by our profession in the past that it had, until a few years ago, fallen almost entirely into the hands of the layman and the charlatan; and it is time that the profession took up this branch seriously in our Colleges and elsewhere.

Special numbers devoted to the subjects of Immunity and Prophylaxis, and a special Surgical issue are already in preparation.

Readers who are willing to contribute original articles for these numbers are invited to forward them to the Editor as soon as possible.

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General Articles

VETERINARY SCIENCE AND AGRICULTURE.*

By DR. P. J. DU TOIT, DR. MED. VET.,
Chief Veterinary Officer to the Cape Government of S. Africa.

THE prominent position which veterinary research occupies in the scientific life of South Africa to-day and the valuable practical results which have been obtained in this field of work have encouraged me to choose as the subject of my address the rôle which veterinary science plays in the agricultural development of a country. For obvious reasons my remarks will be confined almost exclusively to the live-stock side of agriculture in the wider sense ; and for equally obvious reasons most of my examples will be quoted from South Africa.

Since the beginning of the present century the growth of veterinary science has been remarkable. Indeed, it may be said that a new veterinary science has arisen unobserved by the general public. A quarter of a century ago the veterinarian was looked upon as a moderately useful though obscure member of the community, whereas to-day he is regarded as an essential factor in the economic machine of the State. In this transformation of veterinary science the British Dominions and Colonies played no unimportant part. The veterinarians who had migrated to those countries and taken with them the stock of knowledge which they had obtained at the European Veterinary Schools, found themselves confronted with new problems which required solution. Research work on a large scale became necessary. Novel methods of attacking disease had to be devised. The farmer soon came to realise that his very existence depended on the protective measures of the veterinary staffs.

I propose to review briefly some of the most notable achievements of veterinary science in recent years, and to indicate how the work of the veterinarian has become interrelated with that of workers in other branches of science.

Animal Diseases.

Trypanosomiases.—Probably no other single group of disease-producing organisms has retarded the agricultural development of the continent of Africa more than that of the trypanosomes. If the cattle population of Africa be estimated at about 40 million head, it is quite safe to say that this number could easily be doubled if the danger of

* The presidential address to Section M (Agriculture) of the British Association, delivered at Bristol on Sept. 8.

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trypanosome infection were removed. In Nigeria, for example, only a portion of the drier northern provinces is suitable for cattle ranching ; the much more fertile southern provinces are practically devoid of cattle on account of the ravages of trypanosomiasis. Similar conditions obtain in almost every territory in Africa (except the extreme south). The soil is fertile, grazing is plentiful, the climatic conditions are favourable, but the presence of tsetse flies and trypanosomes renders cattle farming impossible.

Fortunately, we can record considerable progress in this field of work during recent years. The problem has been attacked along two lines mainly. A direct attack has been launched against the parasite by means of drug treatment ; and an indirect attack on the disease has been made through a campaign against the transmitter, the tsetse fly. The third line of attack, the immunisation of animals against infection, has not yielded very promising results.

One further trypanosome disease should be mentioned here, namely, dourine. Known for about a hundred and fifty years, this disease has been responsible for very heavy economic losses to horse breeders in Europe and other countries. With the aid of modern methods the disease was eradicated from most of the closely settled and well-organised western European States. But in the vast open spaces of Canada and other countries its eradication proved to be a much more difficult problem. It was only when Watson in Canada succeeded in perfecting a delicate diagnostic test for the detection of the infection that the eradication of the disease could be attempted seriously, and the results of the subsequent campaign in Canada have been entirely satisfactory. It should be added that Watson's success has stimulated further research into the problem of diagnosing other trypanosome infections by serological methods. A fair amount of success has attended these efforts and quite recently Robinson at Onderstepoort has reported further progress in the serological diagnosis of *Trypanosoma congolense* infection.

Piroplasmoses.—Under this heading are included diseases like redwater or Texas fever of cattle, biliary fever of dogs and horses, " gallsickness " or anaplasmosis, and East Coast fever of cattle.

Their etiology was completely obscure until Theobald Smith and Kilborne in America, in a series of brilliant researches extending over the years 1888-92, succeeded in elucidating the nature of the first-named disease. Not only did these investigators discover the causal organism in the blood of infected cattle, but they also proved that the disease was transmitted by ticks and that the infection passed through the egg of the tick from one generation to the next. All this was completely new to science ; it was the first time that the transmission of

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a mammalian disease through an invertebrate host had been proved experimentally. This contribution to science by two veterinarians is worthy of special note.

In the case of redwater, great advances can be recorded. The direct method of attack is eminently satisfactory, thanks to the discovery by Nuttall and Hadwen in 1909 that the drug trypanblue has a specific action on the parasite of redwater of cattle and biliary fever of dogs. The treatment is so successful that the disease has lost much of its terror since the discovery of the value of this drug.

In the case of anaplasmosis, a method of immunisation has been practised in South Africa for nearly twenty years and has been the means of saving thousands of animals.

Of the diseases mentioned in this section, East Coast fever is the most formidable, because of the very high mortality attending it. This disease must have cost South Africa several million pounds since its first appearance nearly thirty years ago. The loss to the country has been partly direct through the death of many thousands of animals, partly indirect through the costly organisation which it is necessary to maintain to fight the disease.

It is impossible in this brief review to discuss the methods employed in the eradication of East Coast fever, or the many practical difficulties encountered in this campaign. For our purpose it is sufficient to state that the dipping of cattle in an arsenical bath has proved to be a very valuable aid in the fight against East Coast fever or any other tick-borne disease.

In South Africa dipping has been practised since the beginning of this century, and has now become an integral portion of the daily routine of farming. No up-to-date stock farm can be found to-day without at least one dipping tank. Even if all the tick-borne diseases should now disappear, the majority of farmers in South Africa would continue to dip their animals regularly. The extent to which dipping is practised to-day may be gauged by the fact that there were in the Union of South Africa in 1929 more than 13,500 dipping tanks.

In the United States of America, where Texas fever (redwater) is the only serious tick-borne disease, an attempt is being made to eradicate completely the transmitter, *Boophilus annulatus*, by means of dipping. Large areas have already been cleared of these ticks, and the economic advantages to which these areas are entitled after being declared tick free, more than compensate for the expenses incurred.

Virus Diseases.—The vast sums of money which have been spent in Great Britain during the last few years on the eradication of foot-and-mouth disease should convince even the layman of the importance of this group of diseases.

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In the olden days it was rinderpest which caused the severest losses. It has been calculated that the losses in Europe during the eighteenth century amounted to 200 million head of cattle. The disease made its appearance in England in 1865. A Royal Commission was appointed and its report is of value to this day. Later on, improved methods of eradication and prevention were evolved, and to-day most countries are free of rinderpest. However, in the Far East and in Central Africa the disease is still prevalent, and causes serious losses.

Two recent outbreaks of rinderpest, one in Belgium in 1920 and the other in Australia in 1923, both of which were eradicated completely within a few months, have again shown how far veterinary science has advanced during the last century.

South Africa has been free of the two diseases just named for many years. But there are several other virus diseases which play a very important rôle. Among these, horsesickness and bluetongue of sheep are perhaps the most important. An extensive study of the former disease by Theiler and his co-workers has yielded some very valuable results, but the problem of horsesickness cannot be said to be solved. At present a method of immunisation with hyperimmune serum and virus is practised, and this method has given excellent results in mules. About 4,000 mules are immunised annually, and it has been stated that if the Onderstepoort Laboratory had produced nothing else except this method of immunising mules, its existence would have been justified.

The second important virus disease of South Africa is bluetongue of sheep. The disease is of great economic importance and would have been a very serious hindrance to the sheep farmer had it not been for the fact that Theiler discovered a simple method of vaccination by means of which the losses from the disease can be reduced to a negligible quantity. Every year two to three million doses of this vaccine are issued to the farmers, and the ultimate saving to the country must be enormous.

Of the many other virus diseases of animals, only one more need be referred to here, namely, rabies. This most dreaded of all human and animal diseases has been eradicated from many countries, and is being kept out by strict quarantine measures. In 1918 the disease was introduced into England with a dog which had been smuggled in in an aeroplane. Strict measures were put into force and in a comparatively short space of time the disease was stamped out completely. Methods of preventive inoculation of dogs, in countries where the eradication of the disease is very difficult, have been tried on a large scale. The results have, on the whole, been very good; but it is too early to predict the future scope of these methods.

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Bacterial Diseases.—Of the host of bacterial diseases, only a few need be mentioned here. The deadly glanders, which was known before the time of Christ, and even twenty-five years ago still caused severe losses amongst horses and constantly threatened the human population, has now been practically eradicated from all civilised countries—thanks to the accuracy of the diagnostic tests which are used to identify the disease.

Another disease which at one time was responsible for very serious losses and which has now practically disappeared is pleuro-pneumonia (lungsickness) of cattle. In the year 1860 about 187,000 head of cattle are stated to have died in Great Britain of this disease; and the mortality in other European countries at that time was correspondingly high. Towards the end of last century the disease was stamped out in Britain and to-day the greater part of Europe is free of the disease. South Africa, in spite of the fact that neighbouring countries are still infected, has been free of lungsickness since 1915.

Only one other bacterial disease can be mentioned here, namely, tuberculosis. In 1901, Robert Koch, who about twenty years previously had discovered the cause of the disease, startled the scientific world by announcing to a Tuberculosis Congress in London that human tuberculosis and bovine tuberculosis were two distinct diseases which were not communicable from the one species to the other. Unfortunately, this statement proved to be wrong. We know to-day that human beings do contract bovine tuberculosis, and for this reason most civilised countries adopt measures for the suppression of the disease in cattle. The United States and Canada are leading the world in this respect and have spent millions of pounds in compensation for the destruction of tuberculous reactors. Denmark, Germany, England, and other countries are also doing much and have achieved a large measure of success in their efforts to supply to the population milk and beef free of tubercle bacilli. But very much remains to be done. In human beings the mortality from tuberculosis is still high in all countries, and a considerable percentage of the deaths must be ascribed to the bovine strain of the organism. The disease in cattle *can* be stamped out provided enough money is made available.

Recently great interest has been shown in the attenuated strain of tubercle bacilli produced by Calmette and Guerin of the Pasteur Institute. Experiments in which it is attempted to immunise children and young animals, with this strain, are in progress throughout the world. It is sincerely hoped that all this work will prove that the method of Calmette and Guerin has given us yet another weapon against this insidious disease.

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Internal Metazoan Parasites.—The only group that need be mentioned in this brief survey are the worms. These parasites have become more and more important and to-day they actually constitute the 'limiting factor' in successful sheep farming in many parts of the world. This subject forms a highly specialised science of its own, the science of helminthology—in which many notable successes have been achieved in recent years.

The ordinary stomach worm of sheep (*Hæmonchus contortus*) is world-wide in its distribution and is the cause of very severe losses. Better farming methods will undoubtedly improve the position, but in the meantime farmers look to the veterinarian to rid their sheep of these deadly parasites. Various chemicals have been tried with varying degrees of success, but perhaps nowhere has the success been so marked as in South Africa, where, as a result of the researches of Theiler, Veglia, Green, and others, a method of treatment was recommended which has proved the salvation of many sheep farmers. The method consists of the accurate dosage of a mixture of arsenite of soda and copper sulphate; and the extent to which this method has been applied may be gauged from the fact that at present some 25 million doses of the mixture are issued annually from Onderstepoort. The method is not perfect, but it has been a great factor in making sheep farming a success where otherwise it would have been a dismal failure.

One further fact must be emphasised here. The menace of worm infection has become so great that no sheep farmer can hope to be successful if he disregards the teaching of modern science. Overstocking of farms must be prevented at all costs; marshes must be drained or the sheep kept away from them; the sheep must be treated regularly according to the best methods known. If these precautions are adopted, the parasites can be kept in check and profitable sheep farming will become possible; if the advice is ignored, then the financial loss to the farmer will be the smaller the sooner he gives up farming.

External Parasites.—The two most important groups of ectoparasites, the ticks and the tsetse flies, have already been referred to.

A further very important group are the mites. These minute parasites are responsible for the disease known as scab or mange in animals, and have caused untold losses. In the fight against these diseases the British Dominions have had very signal success. Australia and New Zealand have eradicated sheep scab completely, Canada is practically free of it, and in South Africa, where the presence of a large native population owning a very inferior class of sheep has made the campaign particularly difficult, the incidence of the disease has been

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reduced to infinitesimal proportions and complete eradication is hoped for within a short time.

Another very important ecto-parasite of sheep is the so-called blowfly. The trouble is caused by these flies depositing their eggs in the wool of sheep, especially in the soiled and moist parts, and by the resulting maggots causing serious damage to the wool and the sheep itself. The pest has assumed alarming proportions in Australia and is becoming more and more important in other countries, including South Africa. Determined efforts are being made to combat the pest and valuable progress has been achieved. In this research entomologists and veterinarians are working hand in hand.

Diseases due to Poisonous Plants.—That certain plants are poisonous and may have fatal effects when consumed by animals has probably been known for centuries. However, it is only during recent years that plants have been studied which produce diseases comparable with epizoötic diseases. In this field of research South African workers have been prominent.

One of the most remarkable of these diseases is that known in South Africa as gousiekte (rapid disease) of sheep, which was studied some years ago by Theiler, Du Toit, and Mitchell. The cause of the disease was shown to be the plant *Vangueria pygmæa*. The poison contained in the plant acts on the heart muscle, causing a myocarditis with subsequent dilation of the ventricles. As soon as the process has reached a certain stage the animal dies of "heart failure." To the casual observer the disease presents all the characteristics of an infectious disease.

Other no less remarkable diseases were studied by Theiler and his co-workers. A disease called geeldikkop (yellow thick head) in sheep was shown by Theiler (1928) to be due to a plant *Tribulus terrestris*, although more recent work by Quin, Steyn, and others at Onderstepoort has shown that there are other factors to be considered in the causation of this disease.

Vomiting disease of sheep was studied by Du Toit (1928) and proved to be caused by *Geigeria* spp. The disease may produce very severe losses in certain years, especially after droughts, when the plant is very widespread.

The study of poisonous plants is now being actively pursued in various countries, and further interesting developments may be expected. It is obvious that the co-operation of botanists is essential for the success of this work.

Deficiency Diseases.—The great importance of the vitamins in the nutrition of human beings is so well known that it need not be stressed here. In the case of the common domestic animals (except perhaps

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the pig, the dog, and the fowl) the vitamins seem to be of far less importance than in human beings. On the other hand, mineral deficiencies are, generally speaking, much more important in animals than in human beings. In recent years it has been found that large portions of the earth's surface are deficient in some mineral or other essential for the normal health and growth of animals.

In South Africa, as well as in other African territories and in Australia, the most serious deficiency is that of phosphorus. Theiler and his co-workers have investigated the ill-effects of this deficiency on cattle very fully. They have shown that cattle grazing on phosphorus-deficient pastures develop a depraved appetite for bones and other carcase debris, and this may lead to the ingestion of toxic material with fatal results (lamsiekte in South Africa); further, that such cattle remain stunted in growth, are late in maturing, are frequently unfertile, produce very little milk, and are very susceptible to various diseases. By the addition of a small daily ration of phosphorus to the diet, they were able to bring about an almost miraculous improvement in the condition of the animals.

As a result of the general feeding of phosphorus compounds in the deficient areas of South Africa, the disease lamsiekte, which a dozen years ago caused enormous losses, has practically disappeared and cattle farming in those areas has again become profitable. The significant fact may be recorded here that the village of Vryburg in Bechuanaland, where ten years ago milk was very scarce, to-day owns a creamery which handles a larger volume of cream than any other creamery in South Africa.

Other Veterinary Problems.

Problems in connexion with the nutrition of animals are now receiving attention in many countries. The vast importance of correct feeding can be illustrated best by referring again to the phosphorus deficiency which exists in the pastures of South Africa and other countries. The astounding results which have been achieved with the addition of a small quantity of phosphorus compounds to the ration of the animals promise to revolutionise the beef and dairy industries.

Animal breeding also presents problems of great importance and these are intimately bound up with the problems of disease and nutrition. In South Africa, as in other countries, there is a constant cry for the replacement of the scrub bull by pedigree sires. This demand would be met to a far greater extent were it not for the fact that in many parts of the country pedigree bulls cannot live because of disease or nutritional difficulties.

In South Africa control over the diseases mentioned above is

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gradually improving and, in regard to the deficient areas, recent investigations by Du Toit and Bisschop have shown that the grading up of native stock can be carried out with complete success provided the deficient mineral is supplied. Both beef cattle and dairy cattle have been bred on the extremely deficient veld of Bechuanaland without signs of deterioration, and the cost of the supplementary ration has been negligible in comparison with the advantage derived from such feeding.

Gratifying though the success which has been achieved may be, the need for further research on live-stock problems has never been greater than it is to-day. The development of enormous areas in the British Dominions and Colonies is entirely dependent on the progress of research. With the aid of further scientific measures, these new countries could absorb a very much larger population than they now harbour. Over-population will not make itself felt for generations, nor need over-production be contemplated seriously.

The prosperity of a very large percentage of the population, both European and native, in the Dominions and Colonies depends on the live stock industry—breeding of pedigree stock; beef, mutton, or pork production; dairy farming; wool or mohair production; skin and hide trade; poultry farming, etc. These farmers look to the veterinary service of their countries more and more for assistance and protection. Without this assistance, profitable stock farming, especially in the tropical and sub-tropical countries, is impossible. The assistance, if it is to be effective, must be based on the latest achievements of scientific research. Rule-of-thumb methods will not suffice.

In a humble way South Africa has proved the wisdom of maintaining an adequate veterinary research service. At Onderstepoort the Government twenty-one years ago established what must be regarded as a fairly large research institute, if the size of the population be taken into consideration. This institute, under the brilliant directorship of Sir Arnold Theiler, soon proved to be not a liability but a valuable asset to the country. The results obtained in any one of its various sections would probably have justified the maintenance of the entire institution.

I have said that the Dominions and Colonies have played an important part in the recent growth and development of modern veterinary science. The quality of the research work produced by veterinarians in these countries has been of such high order that it soon placed veterinary science (which not many years ago was regarded as the Cinderella of sciences) abreast of the other sciences. As a matter of fact, in South Africa it can be said, without disparagement to any other group of workers, that veterinary science occupies a very high,

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if not the leading, position. This has had a wholesome influence on the science itself and on the type of worker who was recruited in its service. The stigma of inferiority which for so long was attached to the veterinarian has disappeared. To-day, veterinary science is looked upon as a field of work which offers almost unlimited scope for research and, in its practical application, may bring untold material benefit to a country.

REPORT ON THE ORGANISATION OF THE CONTROL OF VETERINARY SANITATION IN THE UNION OF SOVIET SOCIALIST REPUBLICS.*

By I. GUINZBURG,

Chief Veterinary Surgeon, Moscow.

THE object in submitting to the present Conference this report on the control of veterinary sanitation in the U.S.S.R. is to make known to the representatives of friendly countries attending the Conference the system of veterinary sanitation in the U.S.S.R., the principles upon which it is based, the manner in which it functions, and its most immediate aims.

Importance in National Economy of the Control of Veterinary Sanitation.

The important role played by veterinary sanitation measures in national economy may be thus stated :—

(*a*) The ensuring for industry and markets of the sale of animals and animal substances in a condition that, from the veterinary point of view, is wholesome.

(*b*) The strengthening and establishment of the measures for the struggle against epizoötics and the check of the contagion caused by the passage through the country of large quantities of cattle and marketing stock.

(*c*) The solution of the social problem, bound up with the preservation of public health, presented by those diseases which are common to animals and human beings.

Principles in Accordance with which Veterinary Sanitation is Exercised.

The following principles serve as a basis for measures of veterinary sanitation within the Union :—

* Read before the U.S.S.R. Congress, Moscow, 1928

(*a*) A far-reaching scheme capable of gradually bringing within the orbit of veterinary sanitation all types of merchandise in cattle and in animal substances.

(*b*) Co-ordination of veterinary sanitation with the victualling plans of the State agencies and the Co-operatives with the object of effecting opportune sales and preventing the spread of epizoötics in the Union.

(*c*) To make the population itself and the co-operative and rural organisations subject to veterinary sanitation measures, so as to secure their active participation and to procure funds for the building and equipment of veterinary sanitation establishments, such as abattoirs, etc.

Fundamental Principles Regulating the Control of Veterinary Sanitation.

Veterinary sanitation measures are regularised in the Union by special legislation, the Veterinary Code, confirmed on the 24th November, 1923, and amplified by the publication of rules, instructions, regulations, and circulars of the Commissariat of Agriculture of the Republics of the Union, which determine all the functions of veterinary sanitation and the duties of the veterinary personnel of both State and civil organisations.

Forms taken by the System of Veterinary Sanitation.

In accordance with their fundamental aims (to ensure for industry and the markets the sale of healthy cattle and animal substances; to prevent the spread of epizoötics which may be occasioned by the movement through the country of cattle and animal substances, and to safeguard the public health) veterinary sanitation measures are applied in the place of origin of the controlled object and at the moment it is at a stage of completion. Consequently the measures consist of :—

(*a*) Those taking effect at the frontier and covering the operations of importing and exporting (veterinary sanitation inspection of imports and exports).

(*b*) Measures relating to the railways and to water and road transport (veterinary sanitation inspection of transport).

(*c*) Measures applicable to industries dealing with animal substances (veterinary sanitation inspection of animal substances).

(*d*) Measures applicable to food, that is to say, those controlling abattoirs (veterinary sanitation inspection of food).

Functions of Veterinary Sanitation with regard to Exports and Imports.

Veterinary sanitation measures of this type have for their object the protection of the Union from the possible introduction of epizoötics

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due to the importation of cattle and animal substances, as well as to the movement of cattle into pasturage across the State frontiers. These measures are applied in the border regions.

A net-work of frontier veterinary sanitation posts has been organised with this object and consequently it is divided, according to territorial conditions, into different sectors, composed as follows :—

1. Sector of the Republic of S.S. Turkmenistan—11 posts, in the villages : Karakola, Gaoudane, Sérakse, Tokta-Bazar, Imam-Nazar, Chiram-Kouiou, Kouchka, Bayate-Kadji, Douchake, Guermabe, and Artike.

2. In the Republic of S.S. Uzbekistan—1 post, the village Termeze.

3. In the Republic of Kirghizie—4 posts, the villages : Oye-Talle, Atébochy, Irekchtame, and Zaouka.

4. Sector of the Republic of Kazakstan—12 posts : Narinkole, Koldjate, Hargos, Sarkane, Barlike-Arassane, Bakty, Boulakty-Boulak, Oulan-Daba, and Djouvane-Tabay.

5. Sector of the autonomous province of Oyrate—4 posts, the villages : Derbeinte-Daba (Koche-Agatche), Ouimone, Ongonday, and Tchoulouchtane.

6. In Siberia—3 posts, the villages : Beisk, Oussinske, and Yermakovo.

7. Sector Bouriato-Mongolia—5 posts, the villages : Mondi, Oulenguine, Geltoura, Kiakta, Oust and Ourlouk.

8. Far-Eastern Sector—16 posts, the villages : Kira, Verknie-Oulkoune, Toktore, Imalka, Zouroukine, Novo-Tsouroukaytouy, Djalinda, Blagovetchensk, Mikailo-Semonovsk, Imane, Spasskoe, Grodekovo, Poltavka, Ekaterino-Nikolskoe, and Kouchara.

In Transcaucasia.

1. Republic of Armenia—9 posts : Agbabine, Ibiche, Tourkkarail, lisse, Bourdacheine, Karakalinske, Markaline, Ramarline, Davaline and Merguine.

2. Republic of Azerbaydjane—17 posts, the villages : Astara, Kilviaz, Dimane, Arousse, Assatkande, Kchaktchi, Belasouvare, Bergame-Tana, Agakandi, Begmanelou, Maraliani, Khoudaferine, Ordoubate, Djoulfa, Nakitchevane, Chaktakty, and Bashkarochane.

3. Republic of Georgia—4 posts, the Localities : Maradidi, Houlo, (Hihadziri), Kardzach, and Vache (Ortchochane).

All the veterinary sanitation posts where reconstruction is at present taking place are adequately equipped with special instruments, biological preparations, disinfectants, animal parks, and special isolation and quarantine areas, served by a staff of veterinary surgeons, assistants, and sanitation veterinarians.

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The work of the staff consists of :—

(*a*) Ensuring that all cattle and animal substances passing the frontier are in a healthy condition, and, when necessary,

(*b*) Applying veterinary sanitation measures to prevent the introduction of epizoötics—in accordance with the ruling of the Veterinary Code, and the special enactments for its development with regard to the transport of cattle and of animal substances.

Over the Asiatic frontier there arrived in the U.S.S.R. during the years shown :

1925/6	Various animals	317,524 head.
	Butchers' produce	142.6 tons*
	Animal skins	5,449.2 ,,
	Wool	12,720 ,,
1926/7	Various animals	253,781 head.
	Butchers' produce	2,564 tons.
	Animal skins and hides	1,351 ,,
	Wool	18,028 ,,

Amongst the imported animals cases were discovered infected with : glanders, contagious pleuro-pneumonia, anthrax, foot and mouth disease, sheep rot, and rinderpest (Far East, Republic of Turkmenistan—Gaoudane region, Post N2, border of Persia and Transcaucasia).

Although all the cattle convoys crossing the frontier were subjected to legal quarantine and rigid control, the above facts serve to emphasise once more that veterinary sanitation methods applied only on the frontier are not a complete guarantee against the introduction of epizoötics and require to be co-ordinated with general measures on the part of the States interested.

Moreover, for the disinfection of imported animal substances that are not accompanied by adequate guarantees of security (certificates) disinfection centres are established in different parts of the Union (Kiakhta, Petropavlovsk, etc.), to disinfect with formaldehyde all animal substances coming into the U.S.S.R., particularly furs (pelts from Tarbagane).

The station at Kiakhta disinfected skins, etc., as follows :—

	Hides of Large Cattle.	Hides of Small Cattle.	Wool.
1925/6	115,241 ..	5,408,024 ..	2,395 tons.
1926/7	25,194 ..	1,412,398 ..	2,259 ,,

The Kiakhta disinfection station underwent a thorough reorganization last year, and it is now possible for it to increase its clearing function, thus facilitating the entry of animal substances from Mon-

* Wherever the word *ton* is used, the Continental ton (=1,000 kilogrammes) s meant.

golia, and ensuring that animal substances in transit shall be in a satisfactory state of veterinary sanitation.

Similarly on the export side, in the main areas for rearing and for formation of cattle convoys and stocks of animal substances for export, in the rearing localities for thoroughbreds : pigs, sheep, cattle, etc., as well as in bacon factories, etc., there have been established, to ensure the best possible condition of veterinary sanitation of all cattle and animal substances sent abroad, special cadres of veterinary sanitation control ; and in the actual regions from which animals and animal substances are despatched to foreign markets there is spread a net-work of controlling and exporting stations, staffed with veterinarians, and provided with special material, biological equipment, and extensive resources.

The increase in our imports and exports of cattle, poultry, and animal substances has imposed on the Veterinary Administration of the Commissariat of Agriculture the formation of an Institute of Veterinary Consultants with authority to act in collaboration with the Trade Representatives and the U.S.S.R. Embassies abroad.

This Institute exists to decide all veterinary sanitation questions arising in our relationships with foreign States in so far as they have to do with the importation of cattle and of animal substances. It has also to notify foreign Governments, through the Embassies, of the veterinary sanitation situation in the U.S.S.R. It is considered as a competent body and has sanction to act in a veterinary sanitation capacity in concert with trade representatives abroad. At the present time there are consultants attached to the U.S.S.R. Trade Representation organisations in Persia, Mongolia, and Italy, and it is proposed to send others to Turkey, Afghanistan, France, and Germany.

Veterinary Sanitation Control of Transport.

The immense territory of the U.S.S.R. and the enormous numbers of cattle and quantities of animal substances in commercial transit are reasons for the inability of veterinary sanitation organisation to have taken entirely under its control, as yet, all the areas of origin ; and it is essential to establish veterinary sanitation supervision on all the means of transport—railways, waterways, and roads.

For this purpose, on the principal lines of communication on which cattle and animal substances are transported within the limits of the Union, there function veterinary sanitation transport posts, 334 of which are State-subsidised and 1,588 maintained by localities. All these posts, with rare exceptions, are furnished with a veterinary sanitation staff, special equipment of technical apparatus, laboratories for diagnoses, apparatus and chemicals for disinfecting, animal parks,

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isolation enclosures, separate platforms for the loading of cattle, drinking troughs, and roosting quarters for poultry in transit.

The extent of the work of organisation is as follows :—

(*a*) The direct responsibility for the satisfactory sanitation of cattle sent by rail, control of the place from which it is sent, and the proper control of certificates accompanying convoys of cattle and loads of animal substances. In addition, should a convoy of cattle be suspect, measures are applied conformable to the veterinary sanitation laws in force, to the regulations for the transport of cattle, and to the special instructions issued on this subject. Then notification is sent to the place from which the cattle came, of the necessity of inspecting conditions of veterinary sanitation in the district and taking the requisite measures.

(*b*) Controlling the arrangements for cleaning, washing, and disinfecting trucks intended for cattle and animal substances.

(*c*) The maintenance of the necessary standard of veterinary sanitation on the railways, that is to say, the proper care of places where dung is unloaded, animal enclosures, platforms, warehouses for animal substances, drinking troughs, etc.

For the disinfection of trucks at the principal railway junctions 20 disinfecting and washing stations have been established, each comprising a special veterinary sanitation personnel of six persons—two Veterinary Surgeons, two Assistants, and two Sanitary Disinfectors. At present there are being constructed at these stations special quarters for the staff, concrete platforms for the washing of trucks, platforms for untainted and infected trucks respectively, and separate places for the unloading of healthy and of infected dung. In the stations through which a large quantity of traffic passes incinerators for the burning of dung are being installed ; as are also, in those localities where the winter is long, specially heated depots for the washing of trucks. In the construction of these disinfecting stations great attention is paid to the filtration and drainage of the water used.

The veterinary sanitation control of the whole of the cattle and animal substances transported during the years 1925-6, is shown by the following figures :—

Cattle	12,004,300 animals.
Poultry	2,249,500 ,,
Fresh meat	237,100 tons.
Other products	28,600 ,,
Hides and skins	62,468,500 pieces.
Other products ..	60,200 tons and 3,882,600 articles.
Furs	24,344,800

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For 1926-7 (figures of the Central Statistical Bureau of the R.S.F.S.R.):

Large horned cattle	1,476,300 head.
Pigs	966,500 ,,

Representing in tons (meat):

Large horned cattle	60,527 tons.
Pigs	9,492 dekatons.
Miscellaneous (butchers') produce	400,190 ,,
Wool	14,190 ,,
Hides and skins	30,070 ,,
Eggs	25,060

The above compose the following proportions of the total traffic in live stock and animal substances:—

1925-6.

Large horned cattle	94.3%
Horses	93.1%
Pigs	100%
Hides and skins	100%
Meat	65.3%
Wool	43.1%

1926-7.

Large horned cattle	100%
Pigs	100%
Butchers' produce	49%
Horsehair, wool and bristles	51%
Miscellaneous skins	100%

There were subjected to all kinds of veterinary sanitation restrictions the following percentages of controlled commodities:—

	1925-6.	1926-7.
Large horned cattle	0.63	0.30
Horses	0.86	0.79
Sheep	0.28	13.18
Pigs	0.16	0.20
Total of mammifers	0.53	4.80
Poultry	0.33	0.09
Fresh meat	0.51	0.16
Other butchers' produce	0.34	0.22
Total of meat	0.50	0.17
Miscellaneous skins	0.55	0.81
Wool, horsehair, and bristles	0.30	0.83

It is clear from the preceding figures that in spite of the enormous amount of work done by the veterinary sanitation service for the

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inspection of transport, a large proportion of the cattle and animal substances in transit escapes veterinary control, and therefore the immediate problem confronting the organisation is, apart from intensifying the work, to broaden it in the future by increasing the number of veterinary sanitation transport posts.

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Veterinary Sanitation Control of Industries Dealing with Animal Substances.

All animal substances which undergo technical processes are, from the moment of their entry into commerce (i.e. at markets and fairs) subjected to the veterinary sanitation control exercised by the personnel of the district veterinary sanitation body, numbering (in 1926-7) 5,243 Veterinary Surgeons and Veterinary Assistants. As animal substances approach the central depots, or bases, and the manufacturing establishments, it being granted that unhealthy elements are introduced into the accumulated stocks by chance causes, they are subjected to the observation of special inspectors, provided with laboratories for making diagnoses and with the necessary equipment of disinfectants and apparatus.

To apply more searchingly the veterinary sanitation measures for the determination of the degree of infection of animal substances with anthrax, legislation has enjoined a method for examining skins according to the Ascoli process. In 1928-9 20 special laboratories were equipped, and of these 12 are already functioning. The prepared scheme allows for the annual release of 8 million skins from the laboratories. The requisite precipitant serum is being prepared under the direction of qualified specialists in 5 Veterinary Bacteriological Institutes (Moscow, Leningrad, Raisan, Voronéje, and Orel). The veterinary surgeons and the technical personnel go through special courses in Ascolisation according to a programme sanctioned by the Commissariat of Agriculture.

Veterinary Sanitation Measures in the Food Industry.

Meat, one of the most important articles of human consumption, can also be for man a permanent source of diseases to which he is subject in common with animals, such as anthrax, tuberculosis, glanders, rabies, foot and mouth disease, intestinal worms, etc., and therefore, to ensure good, wholesome food for the public is one of the major problems for all State organisations and institutions ; and among them the Commissariat of Agriculture.

The proposed aim can be attained only if all butchers' produce, without exception, is subjected to veterinary sanitation control in well-equipped abattoirs and slaughter houses.

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Thus, veterinary sanitation control in the abattoirs is one of the principal factors ensuring the wholesome quality of butchers' produce leaving the abattoirs for human consumption.

Moreover, veterinary sanitation control in abattoirs, which examines cattle before and after they are slaughtered, can, more easily and with greater precision than the other veterinary sanitation organisations, detect individual cases of animal diseases; especially those which are relatively difficult to diagnose during life, particularly at the initial stage, as, for example, contagious pleuro-pneumonia, attacks of worms, etc. It can at once report these diseases to the places in which the cattle convoys were formed, thus contributing, on the one hand, to the prompt checking of epizoötics, and consequently furthering, on the other hand, the favourable rearing of cattle, while at the same time reducing, indirectly, the price of food.

To this effect, a close net-work of abattoirs extending over the Union have been opened and set in operation. They may be classified, in accordance with their allotted functions and the importance of their work, as: (*a*) export industries abattoirs, preparing exclusively commodities for foreign trade; (*b*) industrial abattoirs chiefly supplying the needs of some particular important area, group of towns, or manufacturing and industrial centres, and, finally, (*c*) village abattoirs, of a simplified type, described by the term, "slaughter stations," and serving a fairly limited area.

According to the number of animals slaughtered, the last class may be subdivided as follows:—

(*a*)	Abattoirs with annual slaughter of not less than 1,000 head	31.84%
(*b*)	From 1,000 to 5,000 head	41.88%
(*c*)	From 5,000 to 10,000 ,, ...	8.53%
(*d*)	From 10,000 to 20,000 ,, ...	5.45%
(*e*)	From 20,000 to 30,000 ,, ...	0.98%
(*f*)	From 30,000 to 40,000 ,, ...	0.84%
and (*g*)	40,000 head and over	0.56%

To raise the qualifications of the veterinary personnel at work in the food industry, special courses of study are arranged for Veterinary Surgeons under the auspices of the State Institute of Experimental Veterinary Medicine and of the Bacteriological Institutes, as well as territorial and government courses for Assistant Veterinarians. In addition, special cadres of instruction in trichynoscopy are formed for abattoir workers to qualify them for the task of detecting worm-infested meat.

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Abattoirs of the export industries type, as well as industrial abattoirs and most slaughter stations, have diagnosis laboratories, equipped with special technical plant and the necessary apparatus and instruments for the examination of meat.

The local veterinary service acts provisionally for any slaughter station which does not yet possess a diagnosis laboratory.

The fact that the quality of butchers' produce depends not only on the breed and fatness of cattle, but also, to a certain extent, on a host of fortuitous circumstances, preceding, accompanying, and even following, its emergence in the final state, makes the following points of tremendous importance :—(*a*) the preparation of technical plans for the various types of abattoir buildings ; (*b*) the establishment of slaughtering methods, on which depends the particular degree of bleeding, which in turn has a perceptible effect upon the rate of decomposition ; (*c*) method of cutting up the carcass (horizontally or vertically ; (*d*) the degree of mechanisation with reference to the technical plant of abattoirs, for, owing to its inadequacy or total absence and consequently heavier demands on labour, carcasses may be left untouched, which may injuriously affect the quality of the meat, etc.

To deal with the questions raised and others which may arise in the future, a series of legislative acts have been elaborated and published, as, for example :—(*a*) special regulation for abattoirs, defining the plan of construction for abattoirs (Types of Abattoirs) as well as the source from which they receive support ; (*b*) regulation and instructions outlining (1) method of organisation and upkeep of abattoirs, (2) the means of achieving veterinary sanitation control in abattoirs, (3) rules for the duties of the medical and veterinary personnel in the control area for butchers' produce, (4) method of skinning, with a view to better preservation of hides, (5) means of judging what is waste, (6) the utilisation of meat passed as sound only in particular circumstances and the disposal of produce seized in the abattoirs, etc.

During 1925-6 the veterinary personnel examined and killed in the abattoirs and slaughter stations of the Union 10,504,200 beasts, and during 1926-7 10,760,130 beasts, or 30% of the total of butchers' produce.

To improve the quality therefore of butchers' produce in the markets which issues from private slaughterhouses and to assist those slaughterhouses, a new series of meat-control stations have been established ; and in the Union, during 1925-6, they reached the number of 1,035.

Through the examination of cattle killed in the main abattoirs during 1925-6 the percentage of diseased cases was found to be 20.4, but in the groups of isolated abattoirs the percentage of diseased cases

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detected amounted to 25.2, an indication of highly conscientious veterinary sanitation control.

The relatively high percentage of waste products in the butchering trade and, from another aspect, the merely partial absorption of butchers' produce by veterinary sanitation control increases the necessity of extending still further the net of abattoirs, especially those of the subordinate type (the slaughter stations), so as to abolish the private slaughterhouses and consequently to reduce little by little the number of meat-control stations, which are, after all, to some extent mere substitutes for true veterinary sanitation control.

Simultaneously with the necessity to increase the number of abattoirs arises the need to increase the supply of qualified and specially trained sanitation veterinarians.

To do this it will be necessary to :—

(*a*) Enlarge the Institutes of higher veterinary sanitation.

(*b*) Organise special supplementary courses of training.

(*c*) Found, lastly, a whole series of theoretico-practical schools having for their purpose both the study of subjects related to the examination of meat, and complementary training for the veterinary personnel.

Grants for Veterinary Undertakings.

The sources for all veterinary sanitation undertakings are, on the one hand, grants from the State, and on the other, to a much greater extent, grants from local authorities. From year to year, the sums granted by the State, and still more those granted by the local authorities, steadily increase, especially the contributions towards the building fund. The sums granted by the State during 1928/9 for veterinary sanitation undertakings rose, by comparison with the preceding year, 1927/8, to the extent of 105% and came, not only from the Commissariat of Agriculture, but from other Commissariats also (the Commissariats of Means of Communication, Home Affairs, and Labour).

Apart from the gradual growth indicated and the strengthening of veterinary sanitation control, the organisation of general sanitation work so well established in the Union will further the success of veterinary sanitation measures.

Before the revolution the veterinary service worked in an uncoordinated fashion under various authorities (zemstvos, towns, the Government, establishments for the rearing of horses and stud animals, etc.). This considerably impaired the organisation of sanitation, often by reason of overlapping in the work and inter-departmental friction—but since the establishment of Soviet power, veterinary work has been taken entirely under the jurisdiction of the Commissariat of Agriculture

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(Direction of Veterinary Affairs), which co-ordinates all the work on hand according to unified plan and system.

The general direction of veterinary work in the Union belongs to the Veterinary Committee attached to the Council of Labour and Defence.

In concluding this report we express the hope that, underlying our exposition of the principles regulating veterinary sanitation control in the Union and of the projects and conventions submitted for the study of the Conference, common means of improving the work of veterinary sanitation will be found for the promotion of rural economy in the countries interested. This would tend to strengthen still further the friendly and neighbourly relations already existing between them.

SOME NOTES ON VIRUS DISEASES.

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Presented to a Meeting of the Professional and Technical Officers of the Department of Agriculture, 5th August, 1930.*

SINCE the earliest times infectious diseases have been recognised and attempts made to overcome them ; but the actual cause of many of them remained a mystery. They were attributed to many things—to divine wrath, to evil spirits, to the influence of the stars, the weather, to miasmas, humours and even to spontaneous generation. The advent of the microscope during the early part of the last century introduced new methods of studying them, but it remained for the great Pasteur to bring his genius to bear upon the problem and to demonstrate the microbial origin of disease.

In so short a time these age-old mysteries yielded to the imagination and methods of that great scientist that he would almost appear to have been inspired. The orderly sequence of his work and discoveries were truly remarkable. Commencing as a chemist, he became interested in crystallography, especially in connection with racemic and tartaric acid crystals found in the wine vats. This brought him to the study of fermentations, and he demonstrated that the conversion of sugar into alcohol by fermentation was the result of a vital process of yeast. He found that the conversion of sugar into lactic acid was also due to microscopic organisms. From this he surmised that putrefaction and even disease might be caused by similar bodies. He wrote, " what would be most desirable would be to push those studies far enough to

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prepare the road for a serious research into the origin of various disease."(1) With this idea in his mind, he investigated two diseases of silk worms which were ruining the silk industry in France at the time, and these he proved to be due to " germs." Later he investigated other diseases of animals, such as anthrax, chicken cholera and swine erysipelas, which again he proved to be due to microscopic organisms capable of cultivation in appropriate media outside the animal body. He found also that by various methods the virulence of such organisms could be attenuated to such a degree that when inoculated into a susceptible animal they failed to infect it, but gave rise to immunity or resistance to subsequent infection with virulent organisms. In this way he introduced the principle of preventive inoculation against bacterial diseases, and applying his process further he evolved a method of treatment against rabies.

But in the case of rabies, Pasteur was dealing with something different ; for although he could prevent the disease by inoculation, he could not determine the cause of it. The cause of it was there : the brain and spinal cord, the saliva of the infected animal contained it, but it could not be demonstrated by the microscope, by cultivation or by any of the methods he was accustomed to employ. Hitherto Pasteur had worked with the infinitely small, but here was a disease due to something infinitely smaller. Rabies, in fact, was a disease which belonged to another category. It was a virus disease. He was thus confronted with " new realms to conquer," but, unfortunately, he did not live to conquer them.

Since then an army of workers has laboured unceasingly at the study of what are known as the virus diseases ; innumerable experiments have been carried out, and a veritable mountain of literature has been published concerning them. Many diseases have been added to this list ; some new, like psittacosis, others old, as the " common cold " ; every day the number increases. It would be impossible to give anything like a complete list of them, but the following are a few important examples of the diseases of man, animals, plants and insects which are attributed to them :—

***Virus Diseases.**(2)

Of Man :—

Small-pox, Varioloid, Alastrim ; Chicken-pox ; Herpes zoster ; Encephalitis lethargica ; Poliomoyelitis ; Measles ; German measles ; Influenza ; Common cold ; Dengue fever ; Yellow fever ; Typhus fever ; Trench fever ; Rocky mountain fever ; Rabies.

* Selected from " Filterable Viruses," by Thos. M. Rivers and others.

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Of Animals :—

Rinderpest ; Swine fever ; Pernicious anæmia of horses ; Foot and mouth disease ; Distemper of dogs ; Fowl-pox ; Rous sarcoma of chickens ; Epithelimoma of fish ; Blue tongue of sheep ; African horse-sickness.

Of Plants :—

Mosaic Diseases of—

Corn, sugar cane, millet, rice, banana, hops, buckwheat, spinach, beetroot, turnip, mustard, white and red clover, alfalfa, peanut, celery, sweet potato, tomato, tobacco, potato, water melon, cucumber, lettuce ; sweet william, sweet pea, petunia, lobelia, marigold, aster.

Other than Mosaic Diseases—

Yellows of peach ; Yellows of strawberry ; Rosette of wheat ; Rosette of peach ; Witches' broom of potato ; Bunchy top of bananas ; Spotted wilt of tomatoes.

Of Insects :—

Sacbrood of honey bees ; Wilt of the gipsy-moth caterpillar ; Jaundice of silk worms.

Polyhedral Disease of—

Saturnidæ—buck moth ; Arctiidœ—virgin tiger moth ; Leucania unipuncta—army worm ; Autographa braccica—cabbage worm ; Bombyx mori—silk worm ; Pontia rapæ—cabbage worm.

Of Bacteria :—

Just as lesser fleas have smaller fleas to bite them, so even the microbes themselves are said to suffer from virus diseases, and the so-called bacteriophagy is attributed to them.

But notwithstanding the formidable collection of diseases which have been attributed to virus disease, the nature of a virus is not understood even to-day.

What is a virus ? By the term virus is understood an infective agent so small that it cannot be viewed under the highest power of the microscope. It may also be so small that it will pass through the pores of an unglazed porcelain or other filter. For these reasons the names ultra-visible or ultra-microscopic viruses, filter passers, filtrable viruses have been applied to them. But there are objections to each of these designations. For example, the term ultra-microscopic is misleading. According to Abbé, organisms which are less than 0.1 micron in diameter must remain invisible. Barnard,(3) however, using ultra-violet light and wavelengths of about 250 million parts of a millimetre, claims to have photographed particulars down to a size of 0.08 micron. Some

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organisms cannot be viewed individually, but can be demonstrated in colonies, as, for example, the causal organism in pleuro-pneumonia. After successful culture in the peritoneal cavity of rabbits, masses of these minute organisms become visible. For that reason M'Fadyean suggested that they should be removed from the group under discussion. The fact that a body is ultra-microscopic may only mean that technique is at fault.

Similarly, the terms based upon the ability of the infective agent to pass through various types of filter are open to objection. These filters do not act towards microbes as does a sieve used to sift seeds. Dacloux has pointed out that " even the bacteria of average size, such as the vibrio of cholera, are smaller than the pores of our filters, and their size would permit them to pass through, as a train passes through a tunnel, without rubbing against the walls ; what keeps them back is that they are held against the walls by capillary pressure." (Burnet.)(4) Filtration is not a simple mechanical operation. It is influenced by many factors—the quantity of the virus, its viscosity, the rigidity or dislocation and mobility of the particles in it, their surface tension, the electrical charge on the virus or on the filter, the amount of protein or other substance in the virus mixture, temperature, pressure, time, the structure of the filters. Some bacteria will actually grow through the entire thickness of an efficient filter. The arrest, therefore, of even smaller particles is probably a molecular attraction between the passing bodies and the solid substances bounding the space through which they have to pass. Organisms which are mobile appear to pass more readily through a filter than those not endowed with the power of movement. There are, therefore, innumerable pitfalls in the interpretation of the process of filtration.

If, therefore, the cause of a disease is invisible under the most powerful microscope, is so small that it will pass through a porcelain or other filter, which will hold back the smallest known bacterium, what evidence is necessary to prove that a disease is caused by a virus ? Probably the only possible proof of the presence of a virus is its power of multiplication and the effect it produces. There exists a distinct similarity in the course of virus diseases and those known to be caused by bacteria or other visible living organisms—namely, an incubation period between the introduction of the virus and the manifestation of its effect, its multiplication in the susceptible animal, its adaptability to environment without loss of identity, its assimilation of surrounding medium and its power of setting up a state of immunity.

These points are emphasised because there are two schools of opinion concerning the viruses. Some regard them as living entities

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comparable, as stated, to the bacteria ; but others hold that they are not living, and suggest that they are of the nature of an enzyme or catalyst and " that the increase of the virus is due to the living properties of the host, which, as the result of stimulation by a small amount of virus, reacts by producing fresh virus in large quantities, owing to an unwonted or pathological metabolic activity."(5) Or to express it in another way, that they may be looked upon " as something unorganised, enzyme-like in nature, possibly the result of some deranged function of tissue cells, which, once having been generated, would be capable of again setting in train those changes which in the first instance produced them."(6)

Some of these viruses are of a septicæmic type—that is to say, the blood is the main seat of multiplication, e.g. horse-sickness. Others exert their influence locally upon certain tissues, as, for example small-pox, vaccinia, foot and mouth disease. Some produce remarkable changes in certain cells. In some they bring about a process known as " ballooning degeneration," resulting in the degeneration and death of the cell. In other diseases they appear to stimulate the growth and proliferation of infected cells. In some diseases the lesions caused within the cell are almost characteristic. Some microscopic changes are called " inclusion bodies " and are of diagnostic value. Some regard these bodies as the virus itself, others consider them to be the products of the degeneration of the cells, and others again regard them as the virus surrounded by cellular material. Their actual nature is not entirely understood.

Some viruses are extremely contagious, e.g. small-pox ; others are not spread by contact, but are inoculable, e.g. rabies ; others again are insect-borne. The virus diseases of plants are, I believe, chiefly transmitted by grafting or pruning ; but some *are* insect-borne, as, for example, crinkle or leaf drop of potatoes, which are infected by an aphis, *Myzus persicæ*.(7) Generally speaking, viruses appear to have little in common clinically or epidemiologically.

Until recently it was held that viruses differed from bacteria in that they could not be cultivated apart from the animal body, but several of them have now been successfully grown in the presence of living cells in tissue cultures. For example, Harde claims to have grown vaccine virus *in vitro* in the presence of living corneal cells. If the corneal cells are killed by freezing, no growth is obtained.

" No lifeless culture medium has as yet been discovered which provides a virus with the substances required for its maintenance and growth." (Carrel.)(8) Vaccine virus has been grown by Rivers and Carrel in pulp made of skin, cornea or brain of chick embryos suspended

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in tyrode solution containing the virus. The embryonic pulp which originally inoculated with 25 or 250 units per c.c. contains eventually 100,000 units per c.c. after eight days' cultivation. Carrel claims that " it is probable that a chick embryo crushed to a fine pulp is capable of producing as much vaccine as a calf." Hitherto the only method of studying virus diseases has been by the infection of living animals susceptible to them. Their cultivation outside the living body will greatly simplify the study of them, and may lead to the solution of the many problems associated with them.

The study of immunity against virus diseases is of considerable interest and importance. It may be said to have commenced with the researches of Jenner, who, in 1796, was able to put the practical experience of the Gloucestershire dairy folk that recovery from cow-pox protected against small-pox, to scientific proof.

Many of the viruses are infective only for one species of animal, e.g. swine fever for pigs ; others are infective to a number of species, e.g. rabies, which affects man and animals of various species ; none of them appears to be infective to all species. Resistance against them may be natural or acquired, active or passive. Thus man is *naturally* resistant to, say, horse-sickness ; may *acquire* active immunity against measles as the result of recovery from that disease, or against small-pox as the result of vaccination. Or, to take another example, equines possess a natural resistance to rinderpest, which is a disease of ruminants ; cattle can be rendered *actively* immune against it by simultaneous inoculation of virus and the serum of a recovered animal, or can be given a *passive* immunity by inoculating them with the recovered serum without the virus. Such serum has been found to contain virucidal properties, complement-fixating bodies and, it is claimed, agglutinins, which are not present in the blood of naturally resistant animals.

As a rule, immunity resulting from recovery from a virus disease is of long duration, but how such immunity is maintained is not known. It is thought that certain cells cease to be susceptible to the harmful influence of the specific virus, but their invulnerability must be inherited by their daughter cells. Others attribute this lasting immunity to persistence of infection. There are diseases where infection does remain for a considerable time, as, for example, pernicious anæmia of horses and foot-and-mouth disease ; but there are certainly others in which it does not, as, for example, measles.

Certain " potato plants," although outwardly perfectly normal and healthy, yet carry in their sap one or more potato viruses—that is to say, the virus exists in a quiescent yet infective condition within the

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" carrier " plant, which exhibits no disease symptoms. " If a scion from such a plant be grafted on a healthy plant of another and susceptible variety, the disease develops in the latter, although the scion continues to show no symptoms."(9)

Similarly, a common weed, black nightshade (*Solanum nigrum*), has been found to carry certain of these virus diseases of potatoes, although itself unharmed by them.

Just as there are various strains of virus, as in foot and mouth disease and African horse-sickness, so immunity against one strain does not necessarily hold good against another. Each virus, therefore, must be attacked as a separate entity.

There are various methods of setting up immunity against virus diseases, but it appears that lasting immunity can only be acquired as the result of recovery from infection. The inoculation of human subjects from cow-pox to protect them against small-pox has been referred to. At the present time inoculation with viruses modified or attenuated by admixture with chemical substances is in vogue. For example, the canine-anti-distemper vaccine is prepared by treating a spleen emulsion from an infected dog or ferret with phenol or formaldehyde. Heat can also be used ; 55 degrees C. for 1 hour or 60 degrees C. for 30 minutes will inactivate the virus. The procedure in practice is to give first a dose of vaccine, and after a week or 10 days a dose of living virus, the reaction to which is thus modified or controlled. The formaldehyde method is also now employed in preparing a rinderpest vaccine, and experiments are in hand with a view to obtaining a horse-sickness vaccine in a similar manner. Carbol-glycerine is used instead of formaldehyde in the preparation of vaccines to protect against fowl plague and rabies. How these agents act and whether the constituents of these vaccines are dead or alive, or partly dead and partly alive, is not precisely known. It is probable that there are some living elements in them which, although incapable of producing symptoms, can still propagate in the tissues of the host for a certain time, and thus bring about immunity against a natural or artificial infection with a full strength virus.

The serum of a recovered animal is sometimes made use of to control the action of virus. Thus in rinderpest and horse-sickness the simultaneous virus-serum method of inoculation is employed, the reaction of a small quantity of virus being restrained by a large quantity of immune serum. An animal rendered immune in this way can be hyperimmunised by repeated injections of virulent material, the protective properties of its serum becoming enhanced thereby.

The manner in which the serum acts upon the virus is a matter for

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speculation. It does not appear to be a chemical interaction, but rather a loose binding between virus and serum, which can be again separated. Todd found in the case of fowl plague that a virus-immune serum mixture was non-infective if injected into the muscles, but was infective if diluted. Andrewes demonstrated in the case of vaccinia that a virus-serum mixture introduced intradermically produced no lesion. If serum was first injected and virus later, no lesion was produced, but if virus was injected five minutes before the serum, a local lesion occurred. In the case of herpes, if virus and serum were introduced immediately after mixing, lesions occurred, but no lesions were met with if they had been in contact for four hours.(10)

In tissue culture similar phenomena are met with. If virus is introduced into a medium consisting of normal tissue bathed in normal plasma or serum, inclusion bodies are found in the tissues which are infective, indicating the activity of the virus in them. If immune tissue is bathed in immune serum, virus does not propagate and no inclusion bodies are found in the tissue. If immune tissue is bathed in normal serum, inclusion bodies are formed in the tissues which, if washed free from serum, are infective. The study of these phenomena *in vitro* will greatly simplify the investigation of the problems associated with the virus diseases, which hitherto could only be studied by infecting susceptible animals.

It would be impossible for me in the time at my disposal to deal with the numerous diseases enumerated in the list given at the beginning of this paper, and I propose, therefore, to leave the virus diseases of man, plants and insects to those who specialise in them, and who, I hope, will take part in the discussion later. I will content myself by giving you a few particulars concerning African horse-sickness, a disease in which I have been interested for the past 25 years and one which will serve to exemplify some of the points emphasised in my paper.

African horse-sickness is a disease of horses, mules and donkeys. The latter are highly resistant to natural and artificial infection, but I have seen donkeys which have died from the disease naturally acquired, and I have killed horses by inoculating them with their blood. Dogs are also susceptible by inoculation, and, as I demonstrated in 1911, may contract the disease by feeding on the meat of a mule dead of the disease. Young Angora goats have been infected artificially, and their blood proved infective to dogs, but, strangely enough, the blood of the reacting dogs did not prove infective to horses.

In natural conditions, however, horses and mules are the chief victims of this disease, and in the pre-inoculation days in this Colony

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the mortality among them was enormous. It is estimated that in some years over 75 per cent. of the equine population of the Colony was destroyed by it. It was not until 1905 that Theiler's method of inoculation was successfully applied for the protection of mules, and in 1915 my own method of inoculation was introduced for the protection of horses and later for mules.

The virus of horse-sickness is extremely small, it will pass through the finest-grained filters ; it resists considerable heat—up to 50 degrees C.—but is destroyed by desiccation. It will remain infective for many years when preserved in a solution of glycerine, phenol and water—in my own experience as long as 14 years. It is remarkably resistant to putrefaction. It is closely associated with the red blood cells, from which it cannot be separated by washing. The minutest trace of it (even as small a quantity as 0.001 c.c. of a highly virulent virus) will cause the disease if inoculated under the skin or into the vein of a susceptible animal. But 100 to 200 c.c. are necessary to infect if given by the mouth. After inoculation there is a period of incubation, when no changes in the animal are noticeable. This varies from four to eight days, according to the strength of the virus. The first indication of infection is an elevation of temperature, which continues to rise for several days before the symptoms of the disease are manifested. It is frequently only at the termination of the disease that these become appreciable, and often an animal appears to die quite suddenly. But from the time of the first elevation of temperature the whole body is permeated by the virus—the animal becomes a veritable skinful of it. A single drop of its blood, taken during the febrile stage, is capable of setting up the disease if transferred to another susceptible animal. In the words quoted before, the virus has multiplied in and assimilated the tissues of the animal, and has not lost its identity in the process.

It is not known how in nature the virus is transmitted from the sick to the healthy animal. Horse-sickness is not a contagious disease, but it is readily inoculable.

How, then, is the disease transmitted ? It has been shown experimentally that if night-flying insects are excluded from stables by suitable mosquito netting, the animals in the stables are protected from infection. Various species of mosquito were tested as to their ability to transmit infection, but none of them could be definitely incriminated. Practical experience in this Colony throws suspicion upon the midge, but its guilt has not been put to scientific proof. If a horse is exposed to infection in a place where horses are not present, and have not been present for a considerable time, it may contract horse-sickness. From whence is the virus derived ? The reservoir is not known. Theiler(12) tested the blood of innumerable species of birds, the jackal, hedgehog,

rock rabbit, bats, striped mice, grey mice, field bats, zebra and yellow meercat ; 67 injections in all were made without causing infection. Also the blood of reptiles, iguana, water tortoise ; 8 injections in all yielded negative results. He also tested the blood of domesticated ruminants, cattle, Africander goats and lambs, dogs and salted horses and the blood of four natives with negative results. I myself noted that the first case of horse-sickness in Salisbury on each of two years was in horses stabled where sheep were kept in close proximity to the stable. R. I. M. Kelly and I, in one of these instances, took 10 c.c. of blood from each of 23 sheep, and having mixed it inoculated a horse with it, but no horse-sickness resulted. I have also tested the blood of bullfrogs, which I had reason to suspect might be reservoirs of infection, without success.

Under natural conditions a few animals recover ; they are said to be " salted." But such animals are susceptible to relapses or re-infections. As I have said before, a horse which is " salted " in one district may become infected in another. For example, a very old horse which had lived for many years at Glen Lorne Farm died from horse-sickness the first season after its removal to Rhodesville, not seven miles away. I could quote numerous other examples, and the proof of the contention that immunity against one virus may not protect against infection with another has been abundantly demonstrated by laboratory methods. It is also indicated by the charts presented, which show the behaviour of my inoculated police horses when distributed throughout the country and exposed to infection with the viruses of the various districts. Fortunately, in the case of inoculated horses, the immunity conveyed by the strain of virus used protects against most of the natural strains in the Colony.

With regard to the various methods of setting up immunity by artificial inoculation, the method of Theiler previously referred to proved extremely successful in protecting mules, but was less satisfactory with horses. It consisted of the introduction of a small quantity of virus and at the same time a large quantity of hyper-immune serum to control it. The collection of such large quantities of serum was a costly business, and was associated with certain difficulties, such as the fact that the serum of some animals proved hæmolytic (capable of causing dissolution of the blood) when introduced into other animals. Also, a second virus, pernicious anæmia, made its way into the true horse-sickness viruses and gave rise to very undesirable complications. For some years past this method has been superseded in this Colony, both for horses and mules, by my own method.

I have to admit that from the scientific point of view my method

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is most unsatisfactory. The nature of the virus, the manner in which it acts, the reason why one virus differs from another, the explanation of why the vaccine produces a reaction from which the horse recovers, although at a certain time during the reaction every particle of its blood is capable of killing another horse, not being known, the method is undoubtedly quite empirical. But for similar reasons other methods are equally so. Indeed, all methods of conveying protection against virus diseases are open to the same objection. It has, however, served its purpose, and the work in connection with it has not cost the Government a penny ; indeed, a profit has been derived from the disposal of experimental animals enhanced in value by the inoculation ; the sale of vaccine to the public, which has brought in many hundreds of pounds to revenue ; to say nothing of the fact that the B.S.A. Police have been converted into a mounted force, the yearly mortality among their horses having been reduced from 50 to 75 per cent. per annum to less than 3 per cent. According to figures collected by the Police, the total mortality of all equines in the country in the year 1929 from all causes was 12.2 per cent., and among the inoculated horses and mules only 2.69 per cent. But after all the toil and tribulations suffered in elaborating this process, it is no longer required. There are no horses to inoculate.

I have delayed so long in the discussion of horse-sickness that I can only briefly refer to one or two other virus diseases of animals which have been successfully controlled by the Veterinary Profession. For example, rinderpest, which in 1896 swept through this Colony, destroying 95 per cent. of all our cattle on its way south. I cannot attempt to discuss the virus which causes this disease, the symptoms or the many interesting features associated with it. I will only refer to the fact that in 1897 Koch reported to the Secretary of Agriculture of Cape Colony " that blood serum of cattle which have recovered from rinderpest has a certain immunising effect upon healthy stock when inoculated with it." Bordet, Theiler, Kolle and Turner elaborated Koch's idea and placed the simultaneous virus-serum method of conveying immunity upon a sound basis. In September, 1898, the last case of rinderpest occurred in this Colony, which since then has been entirely free from it.(13)

Another success which I feel I must refer to, and which stands to the credit of the Veterinary Profession in this Colony, is the eradication of rabies, which was dealt with in another manner. This virus disease appeared near Bulawayo in August, 1902. By 22nd November of that year 9,483 dogs, of which 32 were visibly affected with the disease, had been destroyed and fourteen persons had been bitten. " By the end of March, 1903, the number of stray dogs destroyed was 29,500 in

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Matabeleland and 8,759 in Mashonaland. Up to the end of March, 1904, the number of dogs put to death for non-compliance with the muzzling regulations totalled 60,000." In 1909 muzzling was abandoned and regulations promulgated which provided that all dogs within a suspected infected area should be kept within a safe enclosure or be chained up for a period of not less than six weeks. This procedure proved most satisfactory, but occasional cases occurred until August, 1913, since when no further cases have been met with in Southern Rhodesia.(14) When the enormous number of native dogs, of jackals and other wild animals susceptible to rabies is remembered, the eradication of this awful disease in a virgin country in so short a period as eleven years is, when compared with the history of other countries, a notable achievement.

Blue tongue or catarrhal fever of sheep is another virus disease which the Veterinary Profession has dealt with successfully by means of an attenuated virus vaccine, without which the sheep industry in South Africa would not have developed to its present state of economic importance.(15)

Thus the practical efforts of my profession against virus diseases have resulted in considerable success and enormous profit to the pastoralist in this Colony and other parts of the world. They may be regarded as an example of the virtue of vision, faith and courage in research. They may appear to the superscientist as unorthodox, but to the practical man they have proved of enormous benefit and a very ready help in time of trouble.

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FAILURE OF THE AGGLUTINATION TEST TO DETECT *BR. ABORTUS* INFECTION IN IN-CALF COWS.

By R. F. MONTGOMERIE, B.Sc., PH.D., F.R.C.V.S., and W. T. ROWLANDS, M.R.C.V.S., D.V.S.M.,
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IT is very generally conceded that the agglutination test is a reliable means of detecting *Br. abortus* infection in cattle, but it is recognised that during a period immediately following infection the blood serum does not give a positive reaction. In the application of the segregation method of contagious abortion eradication, the elimination of the chief source of infection—the infected cow from a short period prior to abortion or *calving* until some three weeks after the expulsion of the fœtus—is dependent upon the periodic application of the test to all animals in the clean herd. If the test is liable to fail to detect the relatively recently infected cow some time before she calves down or aborts, this limitation is of considerable practical importance.

Stockman and McFadyean, even early in their original investigation of the value of agglutination test in the diagnosis of contagious abortion, noted that a cow might abort while her reaction was negative, yet show a strong positive reaction at a later date. They recorded an instance in which three days after the abortion of a seven months' fœtus, the cow gave a negative reaction, whereas a test one month later was positive(1). It was highly probable that the abortion was, in fact, due to infection with *Br. abortus*.

Craig(2) believes that the cow or heifer which aborts but gives no reaction at the time, although she reacts two or three weeks later, is only rarely encountered.

Huddleson, Torrey and Carlson(3), in observing agglutination reactions in a naturally infected herd, found that a small proportion of the cows did not react until a day or two before aborting.

The writers have recently encountered six cows which reacted to the test for the first time shortly after the termination of their pregnancy. All belonged to one herd in which an attempt to control contagious abortion by the segregation method, appeared to be meeting with considerable success. In this work complete agglutination at 1 in 20 has been regarded with suspicion. Complete agglutination at 1 in 40 has been taken as indicating infection although when there was no trace of reaction beyond that dilution a retest was usually made

after a short interval. The table gives an abridged history of these six cows.

Dates of calving & blood testing.	Reaction to the Agglutination Test.					
	Megan.	Martha.	Eira.	Daisy.	No. 17.	Bronie.
16/10/29	—1/20	—1/20	—1/20	—1/20	..	—1/20
22/1/30	—1/20	—1/20	—1/20	—1/20	—1/20	—1/20
20/3/30	—1/20	—1/20	—1/20	—1/20	—1/20	—1/20
15/4/30	..	..	..	..	calved	..
8/5/30	—1/20	—1/20	—1/20	—1/20	+1/40AC1/80	—1/20
19/5/30	..	..	..	..	..	calved
21/5/30	..	..	..	calved	..	..
6/6/30	calved	..	..	..	..	..
7/6/30	+1/20AC1/40	..	..	..	..	..
14/6/30	+1/80	..	..	+1/80	..	..
21/6/30	..	..	..	+1/80	+1/80	+1/80
26/6/30	+1/160	..	..	+1/40 AC1/80	+1/160	..
28/6/30	..	—1/20	—1/20	..	+1/320	..
27/7/30	..	..	calved	..	..	..
28/7/30	..	..	+1/80	..	..	..
19/8/30	..	calved	..	..	..	..
21/8/30	..	—1/20	..	..	..	..
6/9/30	+1/640	+1/160	+1/160	+1/640	+1/320	+1/640

No agglutination = —1/20.
Complete agglutination = +
Almost complete agglutination = AC } highest dilution stated.

Megan was negative to the test seven weeks before she was due to calve ; calved prematurely (eighteen days) and on the following day her reaction was doubtful, while eight days after calving it was positive.

Martha gave a negative test seven weeks before she calved at full time. A sample of blood taken two days after calving was negative to the test, while that taken on the eighteenth day gave a strongly positive reaction.

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Eira's reaction was negative four weeks before full time calving. The sample taken on the day following calving was positive.

Daisy calved two weeks after a negative test. Tested three weeks after calving, the reaction was positive.

No. 17 gave a negative reaction one month before she calved. A test made three weeks after calving was positive.

Bronsie calved to full time, eleven days after giving a negative test. The test made one month after calving was positive.

Each of these six cows was regarded as non-infected at the general herd test made prior to the date on which they were due to calve—the interval not exceeding seven weeks in any instance. They, therefore, were allowed to cohabit with other cattle negative to the test. Although there is no evidence that they did excrete *Br. abortus* at the time of calving, it seems very probable that at least some of them were then serious sources of infectious material. The time at which these animals became infected cannot be definitely ascertained, but the writers have some circumstantial evidence for a belief that it occurred during their dry period—within two months of calving.

In schemes for the eradication of contagious abortion by testing and isolation, various recommendations have been made as to the interval which should elapse between the tests. Usually, the earlier general tests are carried out at approximately monthly intervals but later the interval is extended to one of two months or even longer. The " Pennsylvania Plan for the Prevention, Repression and Eradication of Bovine Abortion "(4) allows a period of not less than 60 days between tests in clearing infected herds. It seems obvious from what has been recorded above that even monthly tests occasionally fail to detect infected pregnant animals before the termination of their period of gestation.

While the period of negative reaction following infection may be of minor importance in the barren cow, it assumes a very serious character in the pregnant animal particularly since it seems to tend to extend relatively close to, or even past, the termination of that pregnancy. Thus an animal which is liable at any moment to become a source of infectious material may be allowed to remain among clean cows. The careful observation of in-calf cows and the provision of calving boxes—the " maternity stalls " so strongly recommended by American workers—must be, therefore, salient features of the segregation method of control.

Since the infected cow generally continues to eliminate *Br. abortus* for three weeks after parturition or abortion, the recently calved cow should, in the absence of definite evidence of freedom from infection, be kept in isolation for at least that period. It is impracticable under

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British conditions, however, to hold in solitary isolation for so long a period, every newly calved cow. The agglutination test may be used to determine the presence or absence of infection in such animals and so free a calving box and reduce interference with normal farm routine. It is apparently unsound to free an animal on a negative result from a blood sample taken a day or two after calving, yet the earlier it can be declared free the better. Experience suggests that the negative reaction of a sample taken after one week has elapsed is good evidence of freedom from infection. When the test of a sample taken at that time is not definitely negative the cow should remain in solitary isolation until its category is defined by a second test, post-parturient by at least two weeks.

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THE DOCTORATE OF VETERINARY SCIENCE IN FRANCE.

ARTICLE II of the Decree of the Ministry of Agriculture, dated June 5th, 1924, stipulates that " foreign Veterinary Surgeons seeking the French diploma of doctor of veterinary medicine may be admitted by the Minister to sit for examination at the *end of their studies* on the proposal of the Councils of the Schools and on the advice of the Chief Council for Veterinary Education. The duration of the course of study is indicated in the proposals of the Councils ; it cannot be less than a year's course."

On the other hand, article 10 of the same decree declares that foreigners, at the demand of the accredited representatives of their Government in France, may be admitted by the Minister of Agriculture to profit by the teaching or instruction of the French Veterinary Schools ; provided that the candidates possess a sufficient knowledge of the French language.

At the end of their course candidates, on the decision of the Minister, are allowed to sit for the examinations at the end of their studies and, if successful, receive a certificate which entitles them to prepare and defend a thesis before the Faculty of Medicine of Paris, with a view to obtaining the degree of Doctor of Veterinary Medicine.

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The examinations, at the end of the course, are on the following subjects :—

1. Industry and control of products of animal origin.
2. Medical pathology.
3. Surgical pathology—surgical clinic.
4. Bovine, ovine, caprine, and porcine pathology ; operative medicine ; obstetrics.
5. Microbic diseases and Sanitary Police.
6. Zootechny and its application to the domesticated animals.

The fees for the course of study are fixed at 1,000 francs per annum.

REGULATION OF THE VETERINARY FACULTY OF THE LUDWIG MAXIMILIAN UNIVERSITY OF MUNICH.

1.—The Doctor degree (*Doctor medicinæ veterinariæ*) will only be granted for a published thesis in the German language and through an oral examination.

2.—Promotion as a rule will only be granted when the veterinary examination of the German Government has been passed. The following must be put before the Dean in writing :—

1. The leaving certificate of a gymnasium or upper school.
2. Proof of passing the veterinary examination, or of acceptance as a Veterinary Surgeon.
3. Two prints of the thesis with appended history of career.
4. The receipt for the fees due (see 8).
5. A declaration from the candidate as to what aid he has had in preparing the thesis, and if any from a foreign source, and that no further help has been given.
6. A further declaration as to whether the thesis in the same, or a similar, form has been submitted to examination for promotion or for any other object.
7. An affirmation that all assertions are true.
8. For work prepared at an Institute not belonging to the Faculty the declaration of the Institute staff that the work was done under its direction by the candidate himself and that he is agreeable to it being put forward as a thesis for promotion.

3.—The thesis must show evidence of scientific work and be suitable for reproduction in a scientific publication. It must furnish proof that the author possesses ability for individual scientific work.

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In place of a fresh original thesis one can submit, at the discretion of the Faculty, an already published article by the candidate showing distinct evidence of scientific work.

The thesis will be submitted to an examination by the select Faculty. In case of acceptance its scientific value will be as *rite cum laude* and *magna cum laude*.

If the work satisfies it receives the note *rite*.

The notes *cum laude* and *magna cum laude* are only given if the dissertation is specially praiseworthy. Occasionally the Faculty by unanimous consent may give the note *summa cum laude*. If the thesis is declined by the Faculty the candidate may work up the same subject and present it again or produce a fresh thesis.

After acceptance of the thesis through the Faculty the candidate must furnish 200 reprints to the Faculty at his own expense. In special cases the Faculty may reduce the number. On the title page must be inscribed " Printed with the approval of the Veterinary Faculty of the University of Munich."

4.—After acceptance of the thesis the candidate has to undergo an oral examination. It consists for the German Veterinarian of a *vivâ você* and an *examen rigorosum*.

The *vivâ você* is conducted by three examiners appointed by the Faculty ; the President is the Dean or his deputy.

Each of the three examiners must examine for at least a quarter of an hour. Thus the scientific more than the practical side of veterinary medicine is accentuated. The *examen rigorosum* consists in a testing of the candidate's knowledge of practical veterinary work.

5.—As well in the colloquy as in the *rigorosum* both speech and writing may be demanded by the examiners to establish a point.

The candidate has to satisfy all the examiners in order to pass.

If the estimation of the oral examination does not coincide in a measure with the marking of the thesis, the collective note of the whole Faculty is confirmed.

6.—If the candidate fails in the oral he can present himself again in three to five months.

7.—After passing the oral and delivery of the printed copies of the thesis the doctor's degree is conferred by handing out the diploma. The right to use the title of doctor depends on receipt of the diploma.

8.—The fee for the diploma is 200 reich-marks.

9.—Foreigners (not belonging to Germany) who wish to obtain the German degree must observe the German conditions.

10.—Foreigners who have not submitted to the German examin-

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ation for the veterinary diploma and who seek to obtain the degree of doctor must :—

1. Furnish proof of a certificate equal in value to that of the official real gymnasium, or high school, of Germany. In case of their homeland not possessing such a school, proof must be furnished and attested that the candidate has obtained a leaving certificate from a school of equal standard to those of the well-known German schools.
2. (*a*) Proof of attendance of so many terms at a veterinary college or faculty, and possession of a Veterinary Diploma. (*b*) Attendance of at least two terms at a German high school and one term at the Veterinary Faculty of Munich.

If the candidate is well known to the Faculty the last condition may be waived by the State Minister for Instruction and Culture.

For the rest, foreigners must observe the conditions prescribed for natives.

11.—The doctorate degree may be cancelled.

1. If the candidate has bolstered himself up by untrue statements.
2. If the promoted person has been guilty of dishonourable dealings or breach of disciplinary laws. Before the withdrawal of the doctor title the person concerned shall be heard.

12.—*Promotio honoris causa* and the title of doctor is given as a recognition for distinguished service if the person is proposed by two associates of the Faculty and at least a majority of three-fourths support them.

Clinical Articles

Phenomenon Noted in the Urinary Examination of Animals during Convalescence after Equine Piroplasmosis.

By MAJOR T. A. B. COCKSEDGE, M.R.C.V.S.,
Chief Veterinary Officer, British Somaliland.

DURING the last 12 months or so I have had several cases of Equine Piroplasmosis, running a somewhat chronic course, with an extended period of convalescence.

Commencing after the active febrile and fulminating stage of the disease, treated as routine practice now with intra-venous injection of quinine, the normal convalescence has at first progressed along the ordinary and expected lines.

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Generally after about ten days or a fortnight the animal appears to hang fire, appetite not particularly good, coat staring and the animal has a generally unthrifty appearance.

I have not found a rise in temperature or been able to demonstrate piroplams in the cases I am describing, and hence do not consider it is a secondary breakdown.

My attention was drawn to the nature of the urine in one of these cases and I decided to make a thorough investigation of the urine.

The urine was viscid, of high specific gravity, cloudy and of a somewhat dirty yellow-ochreish colour.

On chemical examination nothing abnormal was noted.

On microscopical examination certain abnormalities were very marked and the special notable factor was a very high percentage of fat globules, in fact a very marked chyluria.

My reading of the symptoms is that there is a sub-acute nephritis, though other symptoms of nephritis are not very evident.

The cases have generally finally made good recoveries, though protracted.

Osteomalacia in the Dog.

By MAJOR W. S. LORNIE, M.C., T.D., M.R.C.V.S.,
Perth.

A SPANIEL bitch was brought to my surgery, said to be suffering from rheumatism. She had just weaned a few mongrel pups, and was in a thin state bordering on emaciation. A thorough clinical examination was made and the finding was such, that it debarred rheumatics from my diagnosis. Her owner was very positive it was rheumatism and desired that she should be treated accordingly. It was agreed to treat her for a week, and if she did not improve she was to be destroyed.

At the end of the week the spaniel was examined and the opinion formed that it was not rheumatism. Her condition was such that she could not walk—simply crawling along—could not stand up and yet she evinced no pain in any of her muscles or legs. Temperature and heart action were normal and she ate all the food given.

Wishing to know more of her previous history, I got in touch with the owner and he informed me that during the time she nursed her pups, no special food was given, apart from biscuits and slops.

To my mind this was a very poor diet for a nursing bitch and no doubt one of the causes of her poor condition.

My diagnosis, therefore, was based on the poorness of her diet coinciding with the lactation period, causing the deficiency disease now present :—Osteomalacia.

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The treatment given was a liberal diet of food rich in Vitamin " D," combined with a dose of Ostelin* twice daily, i.e. 10-20 drops. A rapid improvement ensued and she went home in a fortnight fully recovered. I saw her a few days ago, and she had quite regained her former rotund appearance and was very lively.

Two Cases of Paralysis in the Dog.

By MAJOR W. S. LORNIE, M.C., T.D., M.R.C.V.S.,

Perth.

1. A PEKINGESE dog, 5-6 years old.

This animal was unable to walk with its hind legs. These legs seemed to be paralysed as in paraplegia, and the mode of locomotion was to drag its hind quarters along the ground, with the hind feet straight behind. From the region of the last rib, the whole hind quarters, had a degenerated appearance.

In consultation with the owner, it was found that the dog would eat nothing but meat, and this gave me the clue.

Treatment.—The dog was given a diet rich in vitamin " D," plus cod-liver oil and 9-10 drops of Ostelin twice daily.

In a fortnight the dog could walk and in three weeks was sent home fit and well.

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2. A PEKINGESE dog, related to the above case.

The symptoms were the same, paralysed in the hind quarters, and unable to walk. This animal had a very bad heart action, with a valvular murmur, and though not too fat, was consequently very breathless. Ostelin and Cod-liver Oil Emulsion was supplied in teaspoonful doses twice daily, and in a week the dog could stand. The leg condition made an uneventful recovery, and in three weeks the dog could run about. The heart action improved very much and at my last visit it was becoming more normal.

Heart Cases.

By MAJOR W. S. LORNIE, M.C., T.D., M.R.C.V.S.,

Perth.

IN canine practice one comes across many heart cases, and in three animals recently examined, the heart seems to have been displaced, it

* Ostelin is a physiologically standardised concentrate of the factor—vitamin " D "—which is essential for correct calcium phosphorus metabolism. It is prepared by irradiation of ergosterol ; is odourless and tasteless and always of constant vitamin " D " potency.

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being very difficult to hear the beat on the left side, but quite easily on the right side. These animals had been injured at one time or other in motor car accidents, and this may have been the result.

A few subjects have come to my notice where a strained heart has been diagnosed. These cases show all the familiar signs of distress on climbing hills or stairs, and they lag behind when out on exercise. Clinical examination in a few dogs shows the heart to be dilated or enlarged. With careful treatment and dieting, these heart conditions recover, provided that there is no valvular disease resulting, and the palpitation gradually decreases.

In the horse it has been found that out of a stud of 80-90 horses, many have irregular heart action—generally in those getting on in years. Their history shows that at some time in their career, they have been employed at heavy dragging work in woods. At various intervals, one of these cases has suddenly gone down with a severe colic, and it is impossible to get them on their feet again. They seem to suffer very severe pain, and become paralysed in the hind quarters, and when lifted, they cannot get to their feet.

From a few *post-mortems* made in this type of case, I have found hypertrophy of the heart, and no bowel lesions. One case had myocarditis. The severe pain evinced is similar to angina-pectoris in human beings, and I am not just certain if this condition has been recorded previously.

Certainly there is a very wide field open for research work on heart ailments in animals.

Hysteria.

By MAJOR W. S. LORNIE, M.C. T.D., M.R.C.V.S.,
Perth.

THIS malady is rather common at the moment, and cases crop up continually. Many drugs have been tried in the treatment of this disease, and for some time I have been treating these cases with a fair amount of success, by simply regulating the diet of the animal and giving a preliminary sharp dose of magnesium sulphate, followed by suitable doses of ostelin.

The disease is probably a deficiency disease, due to over feeding with biscuits and meat. My usual procedure is to stop all biscuits and meat, placing the animal on suitable milk foods, combined with fish, and cod-liver oil if the animal is in thin condition.

Provided that the animals are fed accordingly the condition seldom returns. In one case under my care, the symptoms become manifest if the dog is fed on meat and biscuits, and as soon as the diet is changed

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the animal becomes normal again, showing that diet has a lot to do with it. Veterinary ostelin can be given in these cases, and this drug can be obtained from any veterinary druggists.

Notes on the Rearing of Tiger Cubs.

By D. S. LUND, G.B.V.C., F.Z.S.,
Superintendent, Victoria Gardens, Bombay.

If the tiger cubs are very young, viz. below three months old, they may be fed on goats' milk. A foster-mother goat should be obtained and the cubs allowed to suckle the foster-mother; or cows' milk diluted with water ($\frac{3}{4}$ part milk and $\frac{1}{4}$ part water), should be given in a feeding bottle thrice or four times a day; or Horlick's Malted Milk may be given—say about eight spoonfuls in 4 ozs. of water; when about four months old, the cubs should be given with the milk a little quantity of raw mutton—soft and clean and free from shreds and when they begin to eat and digest the meat, the same should be increased gradually, decreasing at the same time the quantity of milk, when they get used to meat. Till one year the cubs require to be handled very carefully, particularly about the teething time or when they suffer from worms or digestive troubles. For worms "Santonin" in quantity of $\frac{1}{2}$ to 1 grain for young ones, once a month, may be given when they begin to eat raw meat. In an adult tiger the dose of "Santonin" is from 6 to 8 grains. For digestive trouble "Castor-oil" should be given. A teaspoonful or two teaspoonfuls is the dose of "Castor-oil" for young tiger cubs; for adults the dose of "Castor-oil" is from 2 oz. to 3 oz.

The healthy stools are solid and passed twice or thrice a day, and are free from any smell, mucus or blood.

We give beef to our tigers in the Gardens. The quantity for each adult tiger is 12 to 15 lbs. once a day, according to size, but cubs should be given mutton, and when they get used to it, then beef should be substituted gradually. Sometimes fowl may be given, or rabbit.

Diarrhœa, dysentery, distemper paralysis, skin-disease, worm, and other gastric troubles are the commonest diseases in this class of carnivora.

In this Garden the young carnivora are allowed to stay with their mother till they are about six to eight months old, and during the time they are nourished by the mother. They commence to chew meat from the third month and feed with the mother till they are six or eight months old. The cubs are taken out from the cages and are allowed to play on the lawns with the keeper till they are six months old, when they begin to get troublesome and are dangerous to be handled.

The Cultivation of Anaerobic Organisms.

By J. H. MASON, F.R.C.V.S.,
Wellcome Physiological Research Laboratories,
Langley Court, Beckenham.

THE literature contains descriptions of many different methods for the obtaining of pure cultures of the spore-bearing anaerobes and, doubtless, as observed by Heller (1) " success in the isolation of anaerobes depends more on the critical sense of the worker than on the method he employs." Probably most workers will agree that the ideal method is the use of a medium on which surface colonies can be readily grown and, for the less strict anaerobes, the use of blood agar employing MacIntosh and Fildes' (2) or Zeissler's technique (3) gives satisfactory results. One of the disadvantages of such a medium is its opacity, and because of this it was found unsuitable for some of the work carried out at these laboratories. A transparent medium yielding as good results as obtained with blood agar under anaerobic conditions of growth was therefore devised. The base of the medium employed is a tryptic horse muscle digest (Douglas) plus 1.5% agar-agar. To this is added a mixture of sheep or rabbit hæmolysed red cells and serum to a concentration of 10%. The serum is obtained direct from the clot. The red cells are hæmolysed in distilled or " tap " water to " saturation " point, and the solution after being clarified by passing through filter paper is added to an equal amount of " neat " serum, following which, the mixture is sterilized by filtration through a Berkefeld candle. The mixture is added to the melted agar (cooled to about 45° C.) and plates prepared by pouring ; these are dried by incubation at 37° C. for 18-24 hours. Each plate is then sown by smearing the surface with a loopful of a young actively growing culture of the organism. Anaerobiosis is produced by MacIntosh and Fildes method and incubation is carried out at 37° C. for 24 hours.

Many experiments were made to ascertain the animal giving the most satisfactory serum and red cells, and a further series of experiments was undertaken to determine the type of agar giving best results, special attention being paid to the type of peptone and digests employed. The final conclusion was that the Douglas type of digest broth plus 1.5% agar-agar to which is added serum and hæmolysed cells obtained from the rabbit or sheep, was the most satisfactory. (Other experiments indicated, however, that the constituents of horse blood were only slightly inferior to those of the rabbit and sheep.) This medium has been successfully employed for the surface cultivation of B. welchii, Vibrion septique, B. histolyticus, B. sordelli, B. sporogenes, B. tetani, B. œdematiens and B. chauvœi.

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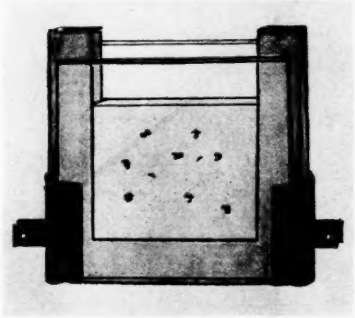
Table I summarises the results of a series of experiments in which various types of medium were used in the surface cultivation of B. welchii. In the table are recorded positive growth results without respect to the number of colonies or amount of growth.

With the more strict anaerobes such as B. chauvœi and B. œdematiens it was apparent that the surface growth even on the above described medium was not always satisfactory. The " shake " or " deep " method of isolation, using hæmolysed cells-serum-agar, was productive of excellent colony formation, but this method has the disadvantages that the colonies are only with difficulty examined under a low power microscope and are not easily picked out. These difficulties have been overcome by the following device. A piece of metal (brass is suitable) is cut to the shape of a square bottomed U (the illustration indicates the dimensions, etc.).



Drawn to $\frac{1}{2}$ scale except thickness of glass and metal.
Thickness of glass = 1·5 mm.
Thickness of metal = 3 mm.

Two pieces of glass (lantern slides are of suitable thickness) are cut to fit, so that when clamped by means of paper-clips in position with the " U " between them, a narrow cavity is formed. A metal cover may be applied to the open end of the apparatus but this has been found unnecessary. The apparatus is sterilized by dry heat and allowed to cool. Melted hæmolysed cells-serum-agar is sown with a suitable dilution of the culture and after being mixed by agitation, is poured into the cavity and allowed to solidify. Incubation for 24-48 hours at 37° C. is then carried out and provided the seeding culture was suitably diluted, isolated colonies are apparent and can be easily examined under a hard lens or low power microscope. For the fishing

of individual colonies, the clips are taken off, one glass slide removed, and a single colony focussed under a dissecting microscope. With a drawn-out pipette bent at a right angle about 0.5 ccm. from the capillary end, the colony is easily sucked out, the necessary suction being obtained by means of a rubber nipple.

The various spore-bearing anaerobes have been successfully cultivated by this method and individual colonies isolated. The method has been found to be suitable for the isolation of colonies of all spore-bearing anaerobes except B. welchii, which, because of the intense gas formation, causes splitting of the medium. B. welchii can, however, be readily cultivated by the surface method.

Table II records the number of colonies obtained when different dilutions of B. chauvœi culture were added to the medium used in this method of cultivating anaerobes. The same experiment with similar results has been carried out using Vibrion septique and B. œdematiens.

SUMMARY.—A medium composed of tryptic horse muscle digest (Douglas) agar to which is added 10% of mixture of equal part of hæmolysed red cells and serum (sheep or rabbit) has been found satisfactory for the cultivation of the various spore-bearing anaerobes.

A special method, in which this medium is used for the isolation of anaerobes, especially the more strict anaerobes, e.g. B. chauvœi, etc. is described.

Table I.

Medium used.	Number of plates Examined.	Number of plates in which growth was :—		Percentage plates showing positive growths.
		Positive.	Negative.	
Agar alone ..	19	1	18	5.2
Agar + oxalated whole blood ..	20	19	1	95
Agar + serum ..	39	12	27	30
Agar + hæmolysed cells ..	40	39	1	97.5
Agar + hæmolysed cells + serum ..	46	45	1	98

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Table II

Medium.	Number of colonies which grew on the various plates. Dilutions.				
	1	2	3	4	5
Agar	0	0	0	0	0
Agar + serum	0	0	2	2	3
Agar + hæmolysed cells	0	1	0	1	3
Agar + hæmolysed cells + serum	12	14	33	29	35

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(1) Heller, H. H., *J. Bact.*, 1921, 6, 5.
(2) Fildes, P., and MacIntosh, J., *Brit. J. Exp. Med.*, 1921, 11, 153-4.
(3) Zeissler, J., Kraus & Uhlenhuth's Handb. d. mikrob. Tech., 1923, Vol. 2.

Reviews

Handbuch der Fleischbeschau. 7th and 8th editions. By Dr. Robert Ostertag. Stuttgart: Ferdinand Enke. 1922. Pp. 621, with 158 figs. in the text and 3 plates. 2 Vols. Vol. I.

THIS standard German text-book for veterinarians, doctors and judges, is well known and its author has an international reputation as an authority on the subject of meat inspection. He divides this volume into eight sections, dealing with: 1—General aspects of meat inspection; 2—Regulations for sale of meat in Germany; 3—Slaughter and examination before slaughter; 4—Examination after slaughter; 5—Expert knowledge about meat; 6—Physiological conditions of significance in meat inspection; 7—General pathology of slaughtered animals from the standpoint of sanitary police; 8—Special significance of diseases of individual organs. The three plates give plain illustrations of most of the important fresh water fish of middle Europe.

The stamping of meat in Germany is very thoroughly done, the flesh of cattle, horses, asses and mules has to be stamped on the sides of the neck, behind the forearm, on the shoulder, on the back in the kidney region, on the inner and outer aspects of the thigh and on the tongue and head. The stampings are circular, triangular or square and indicate good, bad, low in nutrient value, partly good. A colour stamp or branding iron is used. The figures in the text are all well produced and taken from practical examples in the slaughterhouse.

Ostertag places great stress on the examination of animals prior to slaughter and as regards the examination of meat introduced from outside the country he says this is not satisfactory because the animal is not seen

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before slaughter. There are some instructive lines on the examination of birds, crustaceans and fish.

Germany has been a pioneer as regards meat inspection and the German abattoir has been described as the best for cleanliness, hygiene, personnel and scientific methods. No man has done more than Ostertag to keep the matter of meat inspection well to the fore and no man has written with greater knowledge of the subject.

News

Cattle Imports.

SIR J. RALPH JACKSON, M.R.C.V.S., the Chief Veterinary Officer of the Ministry of Agriculture, is the British member of the League of Nations Sub-Committee on Veterinary Police Measures which held its fourth meeting in Geneva on October 20th. This Committee is an offshoot of the main Economic Committee of the League and was charged by the 10th Assembly in 1929 to " frame definite proposals to facilitate the report of cattle and animal products." So far its work has been largely concerning the accumulation of accurate data. The methods of the various countries for veterinary control vary. The Committee's action is intended to ensure a maximum efficacy of control while reducing to a minimum the obstacles to international trade and at the same time guaranteeing that the measures prescribed shall not be used to further economic protectionism. A further subject that has been considered, is the possibility of classifying various animal diseases according to their gravity and the risk of infection. If by standardisation it is possible to ensure that States will furnish ample and reliable sanitary information, it will be possible to simplify the measures taken to guard against the dangers of contagion against which every country wishes to protect its cattle.

At the last meeting, the question of the overseas transport of frozen meat received the attention of the Committee, who were assisted in their investigations by Colonel R. A. Reid, of New Zealand, and Sr. Dionisio Mendy, of Uruguay. Examination showed that the present situation was satisfactory, though in certain questions concerning trade in prepared meats (such as certain pork products) there was some difference of opinion.

Personal

SIR FREDERICK GREEN was chairman of the Special Reception Committee which carried out the arrangements for the entertainment given by the City Corporation at Guildhall in August last to the delegates attending the International Veterinary Congress in London. Last week he was the

host at a luncheon at Guildhall given to meet the Lord Mayor and the Sheriffs and other distinguished guests, and the Lord Mayor presented Sir Frederick with a silver salver as a mark of appreciation of his services by his colleagues, and thanked him on behalf of the Corporation for the important part he had played in making the conversazione a success. The members of the Veterinary Profession invited as guests were Sir John McFadyean, Major-General Sir John Moore, Principal Frederick Hobday, Professor Buxton, and Mr. G. P. Male.

Sir Edward Stern's Generous Gift (£10,000) to the Royal Veterinary College.

At a recent Dinner of the Chertsey Agricultural Society, after the Toast of the Chairman had been given by Mr. Stanley Machin, Mr. F. W. Willett, M.R.C.V.S., Hon. Vet. Surgeon to the Association, rose in support and said that he endorsed all the last speaker's remarks, and he wished to take this opportunity of thanking Sir Edward Stern most gratefully for his remarks about the condition of the Royal Veterinary College. He would like those present to know not only of Sir Edward's generosity to Agriculture, but also of the magnificent donation of £10,000 which he was giving towards the fund for rebuilding the College, the walls of which were shored up at present to prevent them falling. It was a disgrace to our country that this should be. He, the speaker, had been in several countries in Europe and had visited the Veterinary Schools there. In most cases they had splendid buildings, equipment, and surroundings supported by the State, and the Students were also assisted during their College course by their Governments. If every agriculturist, owner of race horses and pedigree stock, would each contribute a pound it would go far to help this most necessary undertaking. The Veterinary Profession had been of great assistance to stock owners and if some of those present could influence anyone to help in this good work they would be doing infinite good, not only for the cause, but for themselves also. Mr. Willett concluded by asserting that the mission of the Veterinary Profession was not only to *cure* disease but also to *prevent* it ; and he indicated how very necessary it was that Veterinary Science and research work should receive the greatest encouragement.

Army Seniority—Precedence of Regiments and Corps.

The King has approved a new table of the order of precedence for corps and regiments in the land forces, and an amendment (No. 29) has been circulated to the Army, altering paragraph 875 of King's Regulations, which gives the precedence table hitherto in use. The table, now amended, attained its form over a period going back to the Restoration, and a close examination at the War Office has removed some anomalies and adjusted the precedence in accordance with regimental history.

The new order of precedence is as follows :—

1. Life Guards and Royal Horse Guards.
2. Royal Horse Artillery.
3. Regiments of Cavalry of the Line.
4. Royal Regiment of Artillery (except R.H.A. and local companies abroad).

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5. Corps of Royal Engineers.
6. Royal Corps of Signals.
7. Regiments of Foot Guards.
8. Regiments of Infantry of the Line.
9. Royal Tank Corps.
10. Local Companies of R.A. abroad.
11. Royal Malta Artillery (from 16th place).
12. Royal Army Chaplains' Department (from 18th place).
13. Royal Army Service Corps.
14. Royal Army Medical Corps.
15. Royal Army Ordnance Corps.
16. Royal Army Pay Corps (from 19th place).
17. Royal Army Veterinary Corps.
18. Army Educational Corps.
19. Army Dental Corps.
20. Queen Alexandra's Imperial Military Nursing Service.
21. Royal Monmouthshire R.E. (from 23rd place).
22. *Supplementary Reserve (from 26th place).
23. *Militia.
24. Hon. Artillery Company.
25. *Territorial Army (from 26th place).
26. Territorial Army Nursing Service.
27. *Militia units in Bermuda, Channel Islands, and Malta.
28. Officers Training Corps.

* In order of arms as for Regular Army.

We congratulate the Mayor of Tamworth (Captain W. Tempest Olver, M.R.C.V.S., J.P.), who has received a unanimous invitation from the Town Council to continue as Mayor for a second year and has accepted the invitation.

KANSAS STATE AGRICULTURAL COLLEGE
Nov 26 '30
LIBRARY

Notice

The Tenth Annual Re-Union Dinner of the Old Comrades' Association takes place at Anderton's Hotel, Fleet Street, E.C., on the 7th November, 1930, at 7 p.m. Dress: Morning Dress.—M. J. Corr, Hon. Sec.

Publishers' Notices

All communications should be addressed to 7 & 8, Henrietta Street, Covent Garden, London, W.C.2. Telephone: Temple Bar 4646. Telegrams: "Baillière Phone, London."

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editor.

Copy of advertisements should be in the hands of the publishers—Baillière, Tindall and Cox—not later than the 25th of the month, or if proof is required, not later than 23rd.

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